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HYDROACOUSTICS INC ROCHESTER N Y
REVIEW OF HLF-3 PERFORMANCE IN PANOIC 77, (U)
OCT 77 D P HOLLINGER, E D MCCLOSKEY
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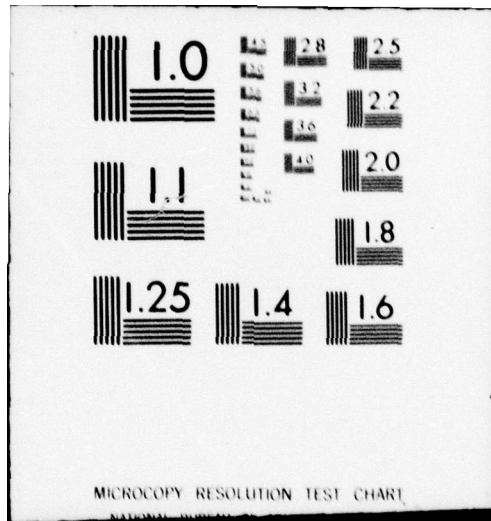
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(6) REVIEW OF HLF-3 PERFORMANCE
IN PANOIC 77

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(11) 11 Oct [REDACTED] 77

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1.0 SUMMARY OF HLF-3 SOURCE PERFORMANCE

For the PANOIC 77 exercise, Hydroacoustics Inc. was contracted to provide the HLF-3 sound source, associated electronic equipment to monitor its performance, and personnel to help in the exercise. The HLF-3 sound source, with tow cable and topside controller-monitor, AC voltmeters, wave analyzer, and Honeywell 5600 instrumentation tape recorder, were shipped to Hawaii. The source was instrumented to telemeter the following parameters to the ship: Sound pressure level, radiator acceleration, depth, water temperature, pitch, roll and body acceleration in two planes. With the help of P.G.I. personnel, the equipment was installed on the USS SAFEGUARD from 29 June 1977 to 10 July 1977.

On 11 - 12 July, a two-day test was conducted off the coast of Oahu. During this time, the source was towed for 18 hours, at a depth of 100 meters, with the standard sequence output. This test tow also served as an acoustic survey for future sites for a bottom installation.

On 15 July, the USS SAFEGUARD departed Pearl Harbor to begin Phase I of PANOIC-77. The ship reached point 1C on 23 July, about 12 hours late due to mechanical difficulties with the ship's steering and engines. At this time, HLF-3 was deployed and operated with the standard sequence. The ship continued on the prescribed track for Phase I until 30 July, when an unsuccessful attempt was made to rendezvous with the SILAS BENT at position 7C. After waiting a couple of hours, we proceeded on to point 11C where we met the SILAS BENT on 31 July. The ship then

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continued on the track to the end of Phase I on 4 August. The source was then brought on deck and we proceeded to Midway. At the end of Phase I, the source had operated for 283.1 hours and had been towed about 2300 miles.

On 10 August, the USS SAFEGUARD left Midway on Phase II. On 13 August, the source was deployed for a 35 hour tow at 100 m depth. The source was then brought back aboard and the ship continued to point 27C, where the source was deployed at a depth of 33 meters on 16 August. After about 12 hours of operation during quite heavy seas, the leak detector light came on intermittently. HLF-3 was therefore retrieved and we determined that the leak indication was due to a mechanical short in the sensor. However, when the source was re-deployed it produced no sound and was, therefore, brought back aboard. While repairs were being made on HLF-3, the HX-137 source was prepared and deployed on 19 August. On HLF-3, we found that a drive button had become unseated from a drive piston closing off the hydraulic drive port. This was corrected, along with other minor problems found when the source was opened. By 21 August, HLF-3 was operational again, and we proceeded to run it on deck for a total of 6 hours. On 24 August, the HX-137 was retrieved and the HLF-3 deployed. The source operated normally until 30 August. At this time, it was decided to retrieve the source 20 hours early due to building seas and a worsening weather report. This completed Phase II, with the HLF-3 source operating for 183 hours and covering about 1500 miles.

The source was never deployed on Phase III of the operation, due to high seas and medical emergencies of the ship's crew.

2.0 REPAIR REPORT

The first indication of a problem with the HLF-3 source occurred when the leak indicator lamp started blinking on and off. After continuing to operate in this manner for about an hour longer, the light came on almost continuously and it was decided to retrieve the source.

With the source on deck, by using an ohmmeter it was determined that the leak sensor was not being shorted by water but by a mechanical short. An oil sample was also taken, confirming that there was no water in the oil. The source was then redeployed, and we attempted to continue operation; however, the source failed to produce any sound. The source was again brought on deck, and the electronics package was removed. Electrical measurements revealed that the problem was in the hydraulics and that a radiator would have to be removed.

When the radiator was removed, we observed that a part of the pump inlet strainer was found to have created the leak detector indication. The motor mounts and inlet strainers also needed replacing. Further tests finally disclosed that the drive buttons had become dislocated from their proper seat in the pistons, forcing the piston up and blocking off the hydraulic drive port. The pistons and buttons were resealed, the motor mounts and inlet strainers replaced, and the source reassembled. After a brief period of operation, the source again stopped operating. This time the fault was traced to a plugged servo valve, probably due to dirt that had entered the system during the previous repair. The servo valve was replaced, and the source was reassembled. At this time a splice in the tow cable was

found to be intermittent, causing a 6-dB drive level shift. This splice was redone and the source operated on deck intermittently, allowing it to cool down between runs, for about six hours of running time without incident. The HLF-3 was later deployed and operated normally for five days. During this time, the hydrophone and temperature probe were shorted out by rain water that had entered the source while repairs were being made. Source Level was confirmed through the radiator acceleration channel.

2.1 RECOMMENDATIONS

This exercise revealed a few minor weaknesses that should be rectified before another tow operation. A temporary fix was made in San Francisco to insure that the drive buttons and pistons remained seated. A more permanent solution to this problem should be found. More mechanically rugged inlet strainers should be fitted to the source.

While in San Francisco the rubber motor mounts were replaced by rigid, steel mounts which should remedy that problem. A slightly more elaborate electrical calibration signal should also be implemented to resolve any questions on the FM telemetry channel calibration. Finally, preceding the next tow operation, time should be set aside to refine the tail shape of the tow body to increase the stability of the tow body.

3.0 HLF-3 EVENT LOG - PANOIC 1977SOUTH SITE EXPERIMENT

DAY (Julian)	DATE/TIME (Uncorrected GMT)	DESCRIPTION
192	111830	Departed pier.
192	112330	Deployed HLF-3.
193	120100	Towing source
	120500	South Site Experiment
	120930	North Site Experiment
	121730	SUS Test
193	121800	Retrieved HLF-3.
END SOUTH SITE EXPERIMENT		HLF-3 operated for 18 hours.

PHASE I

196	160000	Departed Pearl for Midway.
204	230500	Deployed HLF-3 without Horizontal tail. Towing at -15° on side.
	230700	Installed Delta-shaped horizontal tail. Still kiting.
	231000	Commence projector ops.
	231200	SUS/BB event at 300 ft.
204	231250	Resume std seq.
205	240000	SUS/BB event at 300 ft.
	240050	Resume std seq.
	241200	SUS/BB event at 300 ft.
	241250	Resume std seq.
	242109	Lost 440 V ac.
205	242113	440 V ac restored.

DAY (Julian)	DATE/TIME (Uncorrected GMT)	DESCRIPTION
206	250000	SUS/BB event at 300 ft.
	250050	Resume std seq.
	250131	Commence multi-depth experiment.
	25023133	BB at 150 m.
	25025130	End BB at 150 m.
	25031130	BB at 50 m.
	25033130	End BB at 50 m.
	250350	Brought HLF-3 to surface for inspection, straightened tag lines.
	25035130	BB at 100 m, no kiting.
	25041130	End BB at 100 m.
	25050130	End multi-depth; resume std seq.
	251200	SUS/BB event at 300 ft.
	251250	Resume std seq.
	252130	Commence multi-depth experiment.
	252230	BB at 150 m.
	252250	End BB at 150 m.
	252310	BB at 50 m.
	252330	End BB at 50 m.
206	252350	BB at 100 m.
207	260010	End BB at 100 m.
	260100	End multi-depth; resume std seq.
	261200	SUS/BB at 300 ft.
207	261250	Resume std seq.
208	270000	SUS/BB at 300 ft.
208	270050	Resume std seq.

DAY (Julian)	DATE/TIME (Uncorrected GMT)	DESCRIPTION
208	271200	SUS/BB at 300 ft.
	271250	Resume std seq.
	271700	Commence multi-depth experiment.
	271800	BB at 150 m.
	271820	End BB at 150 m.
	27184050	BB at 50 m.
	271900	End BB at 50 m.
	271920	BB at 100 m.
	271940	End BB at 100 m.
	272030	Resume std seq.
208	272035	Position 2C.
209	280000	SUS/BB at 60 ft.
	280050	Resume std seq.
	281200	SUS/BB at 60 ft.
209	281250	Resume std seq.
210	291200	SUS/BB at 60 ft.
210	291250	Resume std seq.
211	300000	SUS/BB at 60 ft.
	300050	Resume std seq.
	301200	SUS/BB at 60 ft.
	301250	Resume std seq.
211	302308	Turned source off. Retrieved HLF-3 for inspection. Source okay. Aborted rendezvous with <u>Silas Bent</u> .
212	310000	SUS event only.
212	310024	End SUS event.

DAY (Julian)	DATE/TIME (Uncorrected GMT)	DESCRIPTION
212	31002408	End SUS event.
	310203	Turned source on.
	311200	SUS/BB at 60 ft.
	311250	Resume std seq.
	311541	Position 11C.
	311600	Commence multi-depth experiment.
	311700	BB at 150 m.
	311720	End BB at 150 m.
	311740	BB at 50 m.
	311800	End BB at 50 m.
	311820	BB at 100 m.
	311840	End BB at 100 m.
212	311930	Resume std seq.
213	010000	SUS/BB at 60 ft.
	010050	Resume std seq.
	01033730	Lost 440 V ac.
	01080230	440 V ac on.
	011200	SUS/BB at 60 ft.
	011250	Resume std seq.
	011418	Commence multi-depth experiment.
	011518	BB at 150 m.
	011538	End BB at 150 m. Rendezvous with <u>Silas Bent</u>
	011558	Resume std seq.
	01155915	End std seq; BB at 50 m.
213	011618	End BB at 50 m.

DAY (Julian)	DATE/TIME (Uncorrected GMT)	DESCRIPTION
213	011638	BB at 100 m.
	011658	End BB at 100 m.
213	011746	Resume std seq.
214	020000	SUS/BB at 60 ft.
	020050	Resume std seq.
	021200	SUS/BB at 60 ft.
214	021250	Start mixed seq.
215	030000	SUS/BB at 60 ft.
	030050	Resume mixed seq.
	030225	Turn north.
	030330	Turn east.
	030435	Turn south.
	030530	Turn east.
	031200	SUS/BB at 60 ft.
215	031250	Resume std seq.
216	040000	SUS/BB at 60 ft.
	040050	Resume std seq.
	041200	SUS/BB at 60 ft.
	041250	Resume std seq.
216	041550	Turn source off.
END PHASE I	HLF-3 towed 2300 nmi with 283.1 operating hours.	
<u>PHASE II</u>		
225	131705	Start std seq; position 22C.
227	150424	End of leg; retrieve HLF-3; position 23C.

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DAY (Julian)	DATE/TIME (Uncorrected GMT)	DESCRIPTION
228	162103	Position 27C.
228	16211820	Start std seq. at 30 meters.
229	170703	Shut source down to check leak detector.
	17071225	Resume std seq.
229	170844	Retrieved source.
230	180610	Initiate HY137 transmission.
237	250250	Deploy HLF-3; start mixed seq.
	251846	Turn north; position 39C.
	251946	Turn east; position 40C.
	252046	Turn south; position 41C.
237	252146	Turn east; position 42C.
238	260029	Hydrophone out.
	26025810	End mixed seq.
	26031930	Resume std seq.
	260700	SUS/BB alert.
	260800	SUS/BB event at 60 ft and 300 ft.
	260850	Resume std seq.
	26094930	Turn north; position 43C.
	261050	Turn east; position 44C.
	26114930	Turn south; position 45C.
	261249	Turn east; position 46C.
	262000	SUS/BB alert.
	262100	SUS/BB at 60 ft and 300 ft.
	262150	Resume std seq.
238	262249	Turn north; position 47C.

DAY (Julian)	DATE/TIME (Uncorrected GMT)	DESCRIPTION
238	262349	Turn east; position 48C.
239	270049	Turn south; position 49C.
	270149	Turn east; position 50C.
	272055	Turn north; position 51C.
	272200	Turn east; position 52C.
	272300	Turn south; position 53C.
239	272356	Turn east; position 54C.
240	280200	SUS/BB alert.
	280300	SUS/BB event at 60 ft and 300 ft.
	280350	Resume std seq.
	281500	SUS/BB alert.
	281600	SUS/BB event at 60 ft and 300 ft.
240	281650	Resume std seq.
241	290200	SUS/BB alert.
	290300	SUS event at 60 ft and 300 ft.
	290350	Resume std seq.
	290555	Turn north; position 59C.
241	291707	Turn at position 60C.
242	300100	SUS/BB alert.
	300145	Turn at position 61C.
	300200	SUS/BB event at 60 ft and 300 ft.
	300250	Resume std seq.
	30130014	SUS/BB alert.
	301400	SUS/BB event at 60 ft and 300 ft.
242	301450	Resume std seq.

DAY (Julian)	DATE/TIME (Uncorrected GMT)	DESCRIPTION
242	301550	Recover HLF-3.
END PHASE II	HLF-3 towed 1500 nmi with 183.4 operating hours.	

PHASE III Cancelled

PANOIC 1977

HLF-3 Summary: 3800 nmi
 484.5 operating hours